DEPENDENCE OF E1 RADIATIVE STRENGTH FUNCTION ON NEUTRON EXCESS

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The radiative strength functions (RSF) are an important constituent to calculate capture cross sections, gamma-ray production spectra, isomeric state populations and competition between emission of gamma-rays and particles. The expressions of dipole RSF in the approximation of an symmetric nucleus (with the same numbers of neutrons, N, and protons, Z) is used as a rule in practical calculations. This leads to an underestimate of a total width of the RSF as well as to a distortion of the RSF shape, specifically in the range of gamma-ray energies close to the neutron separation energy (the pygmy dipole resonance region).

In this work the electric dipole RSF of neutron-rich spherical nuclei is studied using semiclassical methods based on the solution of the Landau-Vlasov kinetic equation for finite two-component systems. In order to obtain accurate results in the pygmy dipole resonance region, it is vital to treat the centre of mass (c.m.) motion correctly. To study this problem the semiclassical RPA (kinetic-theory) approach including dynamical surface effects[1] is used. It is shown that the spurious c.m. motion is exact separated with the use of this method. The resulting isovector dipole RSF displays the low-energy resonance below the giant one. The calculations of the dipole response have been done also by using the semiclassical RPA approach[2] which is modified by an approximate prescription for the separation of the c.m. motion like that one used in the quantum RPA calculations[3]. The results of the both calculations are in rather good agreement. The latter semiclassical approach is used to make more sophisticated calculations with allowance for memory effects in the nucleon collisions[4].

It is found that the neutron excess leads to decrease the collectivity of the isovector giant dipole resonance due to a strengthening of the Landau damping. An additional low-energy strength appears at the values of the asymmetry parameter $I = (N - Z)/A$ like that one in nucleus ^{208}Pb. The approach allows to improve the reliability of the dipole RSF in the wide range of energy from zero to the giant dipole resonance region.

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